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RESEARCH PAPER

The Pattern of Maxillofacial Fracture and its Management in the Northern Region of Bangladesh

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Abstract

Background: The purpose of the study was to characterize various trends in the treatment of maxillofacial fractures as well as to ascertain the pattern of oral and maxillofacial trauma. There may be some evidence from this study to support the suggestion of potential preventive actions.

Objective: The cross-sectional, retrospective study was performed with the intention of identifying the pattern and various approaches to treating maxillofacial fractures.

Methods: A tertiary health care center has treated 213 consecutive occurrences of maxillofacial trauma in the last two years. Patient files and radiographic images were reviewed. We examined data regarding age, gender, anatomical location of fracture and available treatments.

Results: There were 213 participants, ranging in age from 2 to 76, with the age group between 21 and 30 having the highest prevalence. There were 5.25 times as many men as women. According to the study's findings, road traffic accidents (RTAs) accounted for 65.26% (n = 139) of the instances, subsequently followed by falls (n = 40; 18.78%), assaults (n = 17; 8%), sports (n = 11; 5.17%), firearm injuries (n = 2; 0.93%), and industrial trauma (n = 2; 0.93%). Two incidents (0.93%) were linked to other reasons, such as bomb blasts and animal injuries.

A total of 243 fractures were present in 213 patients. Among 213 individuals, 186 had single, isolated fractures, and the rest (n = 27) had multiple fractures. The mandible (62.92%) was the most commonly fractured area. The midface (15.5%), maxilla (4.7%), zygomatic complex (1.9%), nasal bone (1.4%), and nasoethmoidal fractures (0.94%) were the next most common areas. The most frequent location for mandibular fractures was the body (31%), followed by the condylar area (23.48%). Le Fort I was the most frequent fracture among maxillary fractures (40%). Approximately 19% of patients with mandibular fractures underwent open reduction surgery instead of the majority of patients who underwent closed reduction surgery (arch bars with IMF, eyelet wire, and lateral compression plate) (intraosseous and miniplate fixation). While Gillie's technique (38.46%) was the most popular way of caring for zygomatic complex fractures, the majority of maxillary fractures were treated with plain arch bars.

Conclusion: The results of this research can be used as a model for developing preventative and rehabilitative activities because they illustrate patterns of trauma experienced by communities.

Keywords: Fractures, Maxillofacial trauma, Pattern, Road Traffic Accidents.

Introduction

Being the most exposed area of the body, the face is especially prone to injury. [1] Road traffic accidents (RTAs), falls, assaults, sports, gunshot injuries, and industrial trauma are the leading causes globally. [2-4] It goes without saying that the etiology should have an impact on the kind and extent of damage received.[5] According to data gathered in the 1960s and early 1970s, mandibular injuries account for 20% to 60% of all RTAs injuries.[6] While personal aggression causes more injuries to the craniofacial region in developed countries, RTAs account for a larger portion of these

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injuries in underdeveloped countries.[7] The implementation of mandatory seat belts and drink-drive laws has resulted in a notable decrease of 25% in the quantity and intensity of injuries received in traffic accidents. Additionally, the severity of more severe facial injuries has been reduced by two thirds.[8,9] Even though it is acknowledged that many patients who have been assaulted indicated that their injuries were caused by falls, it was discovered that falls were the second most frequent reason after assault. [3,10] There is a rise in amateur sport usage during leisure time as a result of ongoing improvements in personal quality of life and an increasing interest in sports. Injuries related to sports have thus been on the rise. [11,12] Maxillofacial trauma due to firearm injuries has been increasing over the past decades, making it one of the greatest challenges for oral and maxillofacial surgeons.[13] In industrialized cities, there are more reports of industrial trauma. The mandible, ZC, maxilla, and alveolar processes are the most often fractured facial structures in the maxillofacial area. [3] According to some authors, the zygoma is a more vulnerable bone than the maxilla. [14] Two or more of the face bones may be combined in the fracture. According to descending order, the parasymphysis, body, angle, condoler area, symphysis, and coronoid process are the mandibular fracture sites that are most desirable.[15] It has been noted that gender and age are significant variables that affect the incidence of maxillofacial injuries. The 20–40 age group exhibits a significant frequency. The age set higher than 60 and less than 5 years old has the least occurrences. With a male-to-female ratio of roughly 3:1, the majority of patients are men.[16] The purpose of the study was to characterize various trends in the treatment of maxillofacial fractures as well as to ascertain the pattern of oral and maxillofacial trauma. Circumstantial evidence supporting the suggestion of potential preventive actions may be found in this study. For instance, the adoption of seat belt laws in developed nations has, as predicted, resulted in a decrease in the frequency of maxillofacial injuries from RTAs.

Materials and Methods

It was a retrospective, cross-sectional study carried out at the oral and maxillofacial surgery department at Rajshahi Medical College Hospital from January 2020 to December 2021. Since this was a retrospective study and the data came from departmental medical records, no ethical committee permission was needed. A data sheet was formed in order to gather data. Age, gender, mechanism of injury, history of alcohol use, locations of maxillofacial fractures, and other related injuries were taken into consideration when evaluating the patients. RTAs, assault, fall from a height, sports, occupational, gunfire, and other (animal attack, pathological fractures, blast injury) were the categories under which the injuries were categorized. The site of fractures was used to determine their severity: lower third only, middle third, and combination of both lower third and middle third. Mandibular fracture locations were divided into categories: body, angle, ramus, condyle, coronoid, symphysis, parasymphysis, and dentoalveolar. The maxilla, zygoma, naso-orbito-ethmoid, isolated zygomatic arch, orbital floor, and nasal were the classifications for the sites of mid-facial fractures. The Lefort classification was also used to categorize the midface fractures. Microsoft Excel 2016 was utilized to input the data. Employing SPSS Version 17, the relationship between age, gender, injury type, and fracture location was evaluated for statistical assessment.

Results

There were 213 patients with a total of 243 fractures. 213 cases underwent screening; 186 of them had a single, isolated fracture, while the remaining (n = 27) had multiple fractures. RTAs (n = 139; 65.26%) were the most frequent cause of maxillofacial trauma, followed by unintentional falls (n = 40; 18.79%), interpersonal violence (n = 17; 7.99%), sports-related injuries (n = 11, 5.17%), firearm injuries (n = 2; 0.93%), and industrial trauma (n = 2; 0.93%). Two incidents (0.93%) were linked to other reasons, such as bomb blasts and animal injuries.

The patient's mean age (± standard deviation) was 25 ± 8 years, with a range of 2 to 76 years. The patient was typically between the ages of 21 and 30 (n = 70; 32.86%), followed by the 11–20 age group (n = 61, 29%), the 31–40 age group (n = 35, 16%), the 1–10 age group (n = 28, 13.14%), the 41–50 age group (n = 13, 6%), and the 51–60 age group (n = 4, 2%). Of the patients, only 0.93% (n = 2) were older than 60 years old. Men (n = 179, 84%) were affected more often than women (n = 34, 16%) in almost all age groups.

The mandible fractured more often than any other bone, accounting for 134 instances (62.92%), followed by the maxilla in 10 cases (4.7%), the midface in 33 cases (15.5%), and the ZC in 4 cases (1.9%). Two nasoethmoidal and three nasal fractures were noticed as well.

Table I: Fractures Distribution according to the sites

Site	Number of cases	Percentage
Mandibular fracture	134	62.92%
Maxillary fracture	10	4.7%
Zygomatic complex fracture	4	1.9%
Midface fracture	33	15.5%
Mandibular & Maxillary fracture	4	1.9%
Mandibular & Zygomatic fracture	20	9.34%
Mandibular+Maxillary+Zygomatic fracture	3	1.4%
Nasal fracture	3	1.4%
Nasoethmoidal	2	0.94%
Total	213	100%

Table-II provides specifics on the mandibular fracture pattern. Body of the mandible (31%) was the most frequent site, followed by the ramus (1.5%), parasymphysis (10.45%), condylar process (23.48%), angle (21.64%), dentoalveolar (5.97%), symphysis (5.22%), and coronoid process (0.74%).

Table II: Mandibular fracture incidence by anatomic location

Site	Number of cases	Percentage
Body	50	31%
Condyler	38	23.48%
Angle	35	21.64%
Parasymphysis	17	10.45%
Dentoalveolar	10	5.97%
Symphysis	08	5.22%
Ramus	02	1.5%
Coronoid	01	0.74%
Total	161	100%

Table III illustrates the various reduction and fixing techniques used to treat mandibular fractures. 131 cases (81.37%) out of the 161 mandibular fractures were treated with closed treatment; 84 (52.18%) of these instances were treated with arch bars and IMF (elastic), 20 (12.42%) with IMF (eyelet wiring), and 17 (10.56%) with a lateral compression plate, which was primarily employed for edentulous patients and children. Only 30 patients (18.63%) received open reduction and internal fixation utilizing mini-plates and intraosseous wire.

Table III: Techniques for fixing mandibular fractures

Methods	Number of fractures	Percentage
IMF(arch bar + elastics)	84	52.18%
IMF(eyelet wiring)	20	12.42%
Plain arch bar	10	6.21%
Lateral compression plate	17	10.56%
Intraosseous wiring with IMF	10	6.21%
Miniplates fixation with IMF	20	12.42%
Total	161	100%

The distribution of maxillary fractures (Table- IV) was Le Fort I in 20 cases (40%), Le Fort II in 12 (24%), Le Fort III in 9 (18%), and Maxillary dentoalveolar fractures in 9 (18%) patients.

Table IV: Distribution of maxillary fractures

Fracture types	Number of cases	Percentage
Le Fort I	20	40%
Le Fort II	12	24%
Le Fort III	9	18%
Maxillary dentoalveolar	9	18%
Total	50	100%

The plain arch bar, miniplate fixation, intraosseous, and circum-zygomatic suspension wiring were the methods used to treat Le Fort fractures [Table V]. Le Fort I and maxillary dentoalveolar fractures were treated primarily with suspension wiring (18%) and plain arch bar (34%), while Le Fort II and Le Fort III had miniplate fixation (24%) and open reduction with intraosseous wiring (24%).

Table V: Methods of fixation for maxillary factures

Fixation method	Number of cases	Percentage
Plain arch bar	17	34%
Miniplate fixation with IMF	12	24%
Intraosseous wiring with IMF	12	24%
Suspenion wiring with IMF	9	18%
Total	50	100%

Table VI shows that Six patients (22.23%) received treatment using the transoral method, while 10 cases (37.03%) of ZC fractures reduced with the use of the Gillie's temporal approach. Eight patients (29.63%) had the open reduction procedure; 18.52% and 11.11% of these underwent miniplate and intraosseous wiring fixation, respectively. Three patients (11.11%) were treated conservatively.

Table VI: Treatment options of zygomatic complex fractures

Treatment options	Number of cases	Percentage
Gillies temporal approach	10	37.03%
Transoral approach	6	22.23%
Open reduction with miniplates fixation	5	18.52%
Open reduction with intraosseous wiring	3	11.11%
Conservative treatment	3	11.11%
Total	27	100%

Table VII shows those two cases of nasal bone fractures were treated with close reduction and one case with open reduction. The two nasoethmoidal fractures were all treated with open reduction.

Table VII: Treatment of nasal and nasoethmoidal fractures

Treatment options	Number of cases	Percentage
Closed reduction with tape & plaster	1	20%
Closed reduction with manipulation	1	20%
Open reduction	3	60%
Total	5	100%

Discussion

Epidemiological studies on the etiology and prevalence of maxillofacial fractures typically show regional, socioeconomic, cultural, religious, and historical variations in the outcomes. [3] The results of earlier research are in line with the prevalence of maxillofacial fractures in the age range of 21 to 30 years. This is in contrast to the findings of Karyouti's report [17], which indicated that the age range of 0 to 5 years old had the highest prevalence. The high frequency of the 21–30 age groups may be explained by the fact that individuals in this age range engage in risky sports and physical activities, drive recklessly, and are more likely to experience violent crimes. 0.93% of the population over 60 years old had the lowest frequency, which is in contrast to the 0–5 year age range in a study. [18] The lower possibilities of outside activities in old age could be one cause. Males are more likely than females to suffer maxillofacial fractures, according to the majority of the studies. [19] We found a male-to-female ratio of 5.25:1, which is higher (2.2:1) than reported in a previously published article. [3] Given that men engage in outside activities and are frequently exposed to violent interactions, the higher age of men may be five. Male drivers predominate female drivers in the traffic. Maxillofacial fractures were most frequently caused by car accidents in the majority of prior epidemiological research, [2,3] and these results are corroborated by the current study. Conducting interviews with the victims of RTAs-related facial trauma, it became clear that an increase in maxillofacial fractures as a result of RTAs was caused by many drivers' negligence, their inability to yield the right-of-way, and their reckless driving on highways in an attempt to compete with other addict drivers. According to Islam *et al.*[10] and Mijiti A. [18], the act of violence was the main factor in maxillofacial injuries in China and England, respectively. The 8% incidence of violence in this study stands in contrast to their findings. The mandible is more susceptible to injury when the maxillofacial region is wounded than midface fractures.[3] The mandible may have less bone support than the mid-facial bones and is therefore more flexible. However, some mandibular sites are more likely to experience these fractures than others. The majority of studies indicated that the mandibular body was the most commonly affected location.[19] The coronoid process is the least impacted site.[4,19] Contrary to data from research

conducted according to our analysis, the mandibular condylar area is the second most frequently affected location.[1,3] Similar outcomes were noted.[20]

IMF with closed reduction may be used for managing mandibular fractures, according to several reports.[21,22] Closed reduction is a viable treatment option for the majority of mandibular fractures.[23-24] Just 30 out of the 161 mandibular fractures in our series needed open reduction. Without utilizing any external fixation devices, all techniques were employed for fixation. Additionally, under local anesthesia, simple reduction and immobilization techniques were applied to outpatient schedules. Additionally, the outcomes met expectations. The ZC was the area that was most vulnerable in the midface region. This is in line with the findings from previously published reports,[19,25] who noted that the most typical location for fractures in the middle third region of the face was the zygoma. For the midface, simple reduction and fixing techniques were employed, with satisfactory outcomes. In recent times, the application of mini-plates for the treatment of maxillofacial fractures has grown in popularity. [26,27] The low socioeconomic status of patients is the cause of the low incidence of rigid internal fixation, and simple fixation techniques yield good outcomes.[10,28]

Conclusion

According to the current study, the age group of 21 to 30 years old had the highest prevalence of maxillofacial fractures, with RTAs accounting for the majority of cases. Our study's conclusions highlight the need for worry regarding the significant number of maxillofacial injuries brought on by road-traffic accidents (RTAs), given the low usage of safety belts. It is necessary to initiate an awareness campaign to inform people, particularly drivers, of the value of safety precautions and restraints in motor vehicles. These results should notify the relevant authorities about the necessity of enforcing current traffic rules to prevent reckless driving and excessive speeding on highways, as well as the need to build better roads and mandate the use of safety belts.

Additionally, it is imperative that everyone be made aware of the traffic laws, safe driving practices, and the significance of employing restraint devices when driving. This includes school-age children as well as drivers, passengers, pedestrians, and members of the general public.

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